

NON-PUBLIC?: N
ACCESSION #: 8908140351
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Virgil C. Summer Nuclear Station PAGE: 1 Of 4

DOCKET NUMBER: 05000395

TITLE: Turbine Trip/Reactor Trip Due to Inadvertent Shorting of Stator Water
Cooling Signal
EVENT DATE: 07/11/89 LER #: 89-012-00 REPORT DATE: 08/10/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

OTHER: NUE

LICENSEE CONTACT FOR THIS LER:
NAME: W.R. Higgins, Supervisor, Regulatory COMPLIANCE: 803-345-4042
Compliance

COMPONENT FAILURE DESCRIPTION:
CAUSE: A SYSTEM: TA COMPONENT: 62 MANUFACTURER: G080
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On July 11, 1989, a Turbine Trip/Reactor Trip occurred while operating at 100% reactor power. Technicians working inside the "Generator Stator Cooling Water" cabinet inadvertently shorted the power leads on the temperature converter causing the AC power fuse to blow. This gave a false indication of loss of generator stator cooling water which caused a Turbine Trip and a Reactor Trip due to the turbine tripping above 50% reactor power.

In addition to the aforementioned loss, three other generating stations tripped while attempting to compensate for the VARs lost on the grid with the Turbine Trip/Reactor Trip.

As a result of the loss of four generating stations, the offsite voltage to the Engineering Safety Feature (ESF) busses decreased below the minimum acceptable value and a Notification of Unusual Event (NUE) was declared at

1510 hours. The licensee's dispatchers immediately took action to place additional generating units on-line. Both emergency diesel generators came on-line and supplied their respective ESF busses. The offsite voltage to the ESF busses was returned to an acceptable level at approximately 1645 hours and the NUE was terminated at approximately 1710 hours. There were no personnel injuries or releases of radioactive materials as a result of this event.

END OF ABSTRACT

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PLANT IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

EQUIPMENT IDENTIFICATION:

Main Generator Stator Cooling System - EIIS - TJ

IDENTIFICATION OF EVENT:

Technicians working inside the Generator Stator Cooling Water cabinet inadvertently shorted the power leads on the temperature converter causing the AC power fuses to blow. This gave a false indication of loss of generator stator cooling water which caused a Turbine Trip and a Reactor Trip due to the turbine tripping above 50% reactor power.

EVENT DATE:

July 11, 1989

REPORT DATE: August 10, 1989

This report was initiated by Off-Normal Occurrence Number 89-061.

CONDITION PRIOR TO EVENT:

Mode 1 - 100% Power

DESCRIPTION OF EVENT:

On July 11, 1989, at 1435 hours, a Turbine Trip/Reactor Trip occurred while operating at 100% reactor power. Technicians working inside the Generator Stator Cooling Water cabinet inadvertently shorted the power leads on the temperature converter causing the AC power fuse to blow. Loss of AC power

caused a false Indication of "loss of generator stator cooling water," which resulted in the Turbine Trip. A turbine runback relay in the circuitry failed to operate during this event. Should the turbine runback relay have operated, the turbine would have runback to less than 25% and no reactor trip would have occurred. After approximately two minutes, the generator protection circuit caused a turbine trip because the generator output was above 80% and the false signal was still present. The Reactor Trip was initiated due to the Turbine Trip above 50% reactor power.

The Turbine Trip caused the loss of 860 megawatts and 440 MVARs to the grid. When the Virgil C. Summer Nuclear Station (VCSNS) tripped, the loss of reactive

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generation (VARs) caused a decrease in voltage on the electrical system grid. McMeekin generating station, with its generator backup relays set at 118% of generation output (too sensitive given the normal SCE&G standard setting of 150%), saw the voltage decrease. With its generators in the automatic voltage control mode, this station tried to increase voltage. The resulting reactive generation increase combined with the oversensitive relay settings caused the generator backup relays to trip the units at that station.

Subsequently, the Saluda hydro units (in automatic voltage control and with the generator backup relay set at 107%) experienced a similar disturbance and tripped. Then the operating units at Fairfield Pumped Storage (FFPS) tripped. The four FFPS units tripped over a period of approximately 10 to 20 seconds. Their relays were set at 150% but the large voltage decrease due to the loss of units at the other three stations, and the automatic voltage regulator response of their generators caused these units to trip. It was during the period of the loss of the Fairfield units that the ESF busses at VCSNS tripped on undervoltage and power was transferred to their respective emergency diesel generators. In addition, a Notification of Unusual Event (NUE) was declared at 1510 hours due to the degraded voltage condition of offsite power.

With the exception of the failed turbine runback relay, the plant responded as expected. The "A" Train ESF load sequencer energized as the result of the bus voltage decreasing to the loss of voltage setpoint and tripped the "A" ESF incoming breaker. The "B" Train ESF load sequencer energized because the bus voltage decreased to the degraded voltage setpoint and tripped the "B" ESF incoming breaker.

CAUSE OF EVENT:

The cause of this event was due to a series of events. The initiating cause of this event was the inadvertent shorting of the AC power leads to the

temperature converter causing the control power fuse to blow. This loss of AC power resulted in a false indication of "loss of generator stator cooling water" which should have caused a turbine runback. The failure of the turbine runback relay resulted in a Turbine Trip in lieu of a runback to less than 25%. Contributing to the electrical grid disturbance which followed was the fact that SCE&G was experiencing a peak load demand and that VCSNS was providing a high reactive generation. The loss of VCSNS coupled with the overly sensitive generator backup relays at two other generating stations resulted in the loss of those two units. The as found relay settings for those stations were 118% and 107%. SCE&G standard settings of the generator backup relay is 150%, of the generator MVA rating. FFPS station relay settings were set at 150% but the large voltage decrease due to the loss of the other units and the automatic voltage regulation response of their generator caused this unit to trip.

CONSEQUENCES OF EVENT:

This report is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv). In part, this requirement requires reporting of "Any event

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or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)." The RPS was challenged as a result of the Turbine Trip above 50% reactor power.

Emergency equipment (diesel generators) were challenged as a result of the low grid voltage. The event resulted in the Licensee declaring an NUE due to the loss of the offsite power.

Two of the non-nuclear units that were lost are in excess of thirty years old and the sensitive relay settings applied (118% and 107%) were apparently an effort to provide the best generator backup protection possible for the time. The consequence of the sensitive relay setting resulted in the tripping of the units.

CORRECTIVE ACTION:

The Licensee's dispatcher took action to place additional generating units on-line. The offsite ESF circuits were returned to an acceptable level at 1645 hours and the NUE was terminated at 1710 hours.

The interim controls implemented to minimize the probability of recurrence of events of this type are: limit VCSNS reactive output to 300 MVARs unless otherwise approved by the General Manager, Nuclear Plant Operations; generate

a greater percentage of total MVARs at other stations; start Parr gas turbines during peak loads; run one or more FFPS units as VAR generators.

The short term corrective measure taken has been to reset generator backup relays, with the exception of VCSNS, to 175% of generator MVA rating and the replacement of the defective turbine runback relay.

Long term corrective actions include: evaluate the installation of the voltage regulators on VCSNS 7.2 kV ESF busses; further study and evaluation of generator backup relay settings as to the best compromise between generator protection and security against operating for system disturbances; and evaluate the elimination or revision of the interim control measures.

In addition, a review of the design of non-safety instrumentation that could cause a turbine trip will be performed. This review will identify possible reliability improvements and will be completed by July 1, 1990.

ATTACHMENT 1 TO 8908140351 PAGE 1 OF 1

10CFR50.73

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SCE&G

August 10, 1989

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Virgil C. Summer Nuclear Station
Docket No. 50/395
Operating License No. NPF-12
LER 89-012

Gentlemen:

Attached is Licensee Event Report No. 89-012 for the Virgil C. Summer Nuclear Station. This report is submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv). Should there be any questions, please call us at your convenience.

Very truly yours,
O. S. Bradham

RJB/OSB:lcd
Attachment

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